

1. Maths

• i. Why do we study maths at WHPS?

Mathematics is a creative and highly inter-connected discipline that has been developed over centuries, providing the solution to some of history's most intriguing problems. It is essential to everyday life, critical to science, technology and engineering, and necessary for financial literacy and most forms of employment. A high-quality mathematics education therefore provides a foundation for understanding the world, the ability to reason mathematically, an appreciation of the beauty and power of mathematics, and a sense of enjoyment and curiosity about the subject.

The national curriculum for mathematics aims to ensure that all pupils:

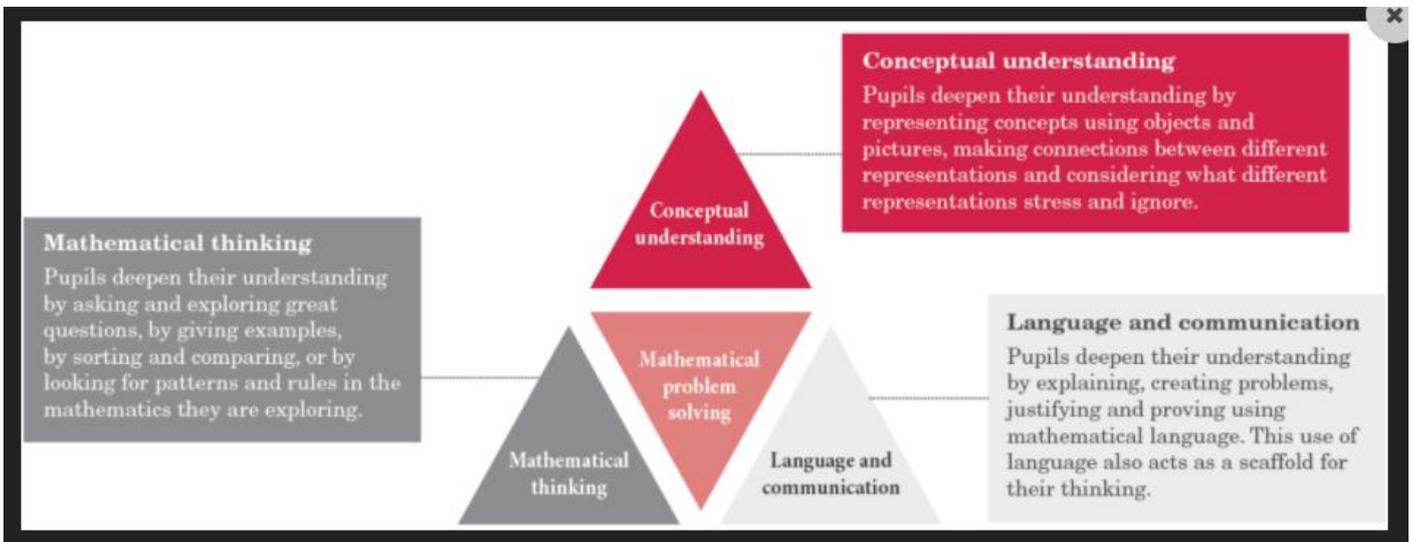
- become fluent in the fundamentals of mathematics, including through varied and frequent practice with increasingly complex problems over time, so that pupils develop conceptual understanding and the ability to recall and apply knowledge rapidly and accurately.
- reason mathematically by following a line of enquiry, conjecturing relationships and generalisations, and developing an argument, justification or proof using mathematical language
- can solve problems by applying their mathematics to a variety of routine and non-routine problems with increasing sophistication, including breaking down problems into a series of simpler steps and persevering in seeking solutions.

At WHPS, we strive for all children to not only have the knowledge, skills and confidence to succeed in maths at school, in their future jobs and in their daily lives, but also to recognise and engage in the enjoyment of numbers and mathematical thinking.

ii. Implementation: a mastery approach to maths at WHPS.

At WHPS, we believe that children's chances of success are maximised if they develop deep and lasting understanding of mathematical procedures and concepts. This belief underpins our mastery curriculum which has been developed over time using a variety of documents, resources and CPD.

The National Curriculum sets out year-by-year programmes of study for key stages 1 and 2. This ensures continuity and progression in the teaching of mathematics and is the basis of what we teach and when. In 2013 we first adopted the Mathematics Mastery school improvement programme which empowers and equips teachers to improve pupils' enjoyment, resilience, understanding and attainment in maths. Year after year, we phased in this programme and it is now adopted throughout the school. Not only have we taken on board the training and development provided to us, we have made it our own and adapted it to the needs of our pupils. A key part of this is the WHPS Calculation Policy (appendix 1) which was developed from a Mathematics Mastery document. At WHPS, we generally follow the 6-part lesson structure (which provides children with opportunities to revisit prior learning, encounter new knowledge, explore it in a hands on way, develop depth of knowledge and practice individually) however recognise that not all lessons will include the full 6 parts. For example, sometimes it may be more appropriate to spread the 6 parts over a series of lessons or only complete some of the parts depending on the nature of the lesson. Regardless of the structure, teachers at WHPS strive to build learning experiences around 'dimensions of depth' illustrated below.

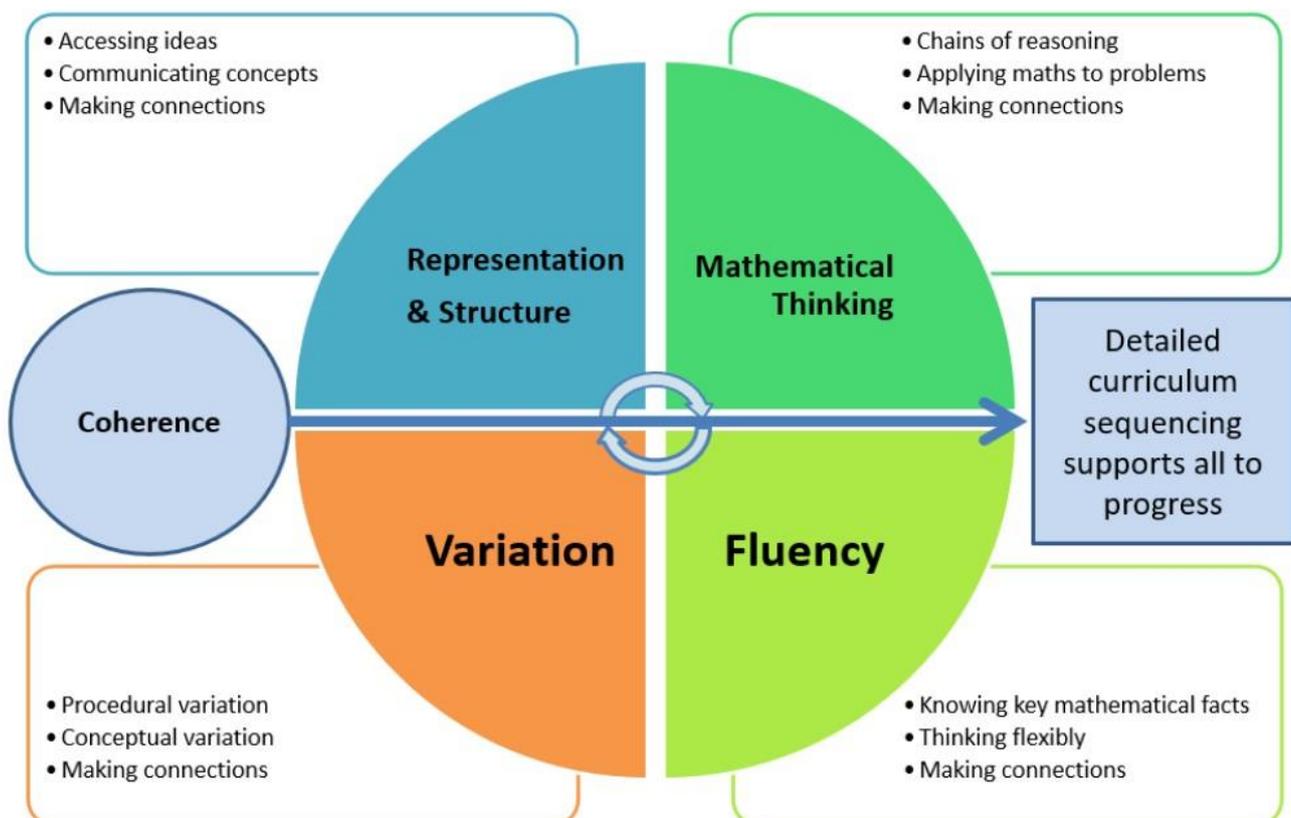


Teaching for mastery rejects the idea that a large proportion of people ‘just can’t do maths’ and teachers at WHPS encourage all pupils through the growth mind-set approach – through hard work (from both the teacher and pupil), we can all succeed in maths.

The expectation is that the majority of pupils will move through the programmes of study at broadly the same pace. However, decisions about when to progress should always be based on the security of pupils’ understanding and their readiness to progress to the next stage. Pupils who grasp concepts rapidly should be challenged through being offered rich and increasingly sophisticated learning experiences before any acceleration through new content. Those who are not sufficiently fluent with earlier material should consolidate their understanding, including through additional practice, before moving on.

There are five big ideas in the Teaching for Mastery approach.

Teaching for Mastery



Coherence

Lessons are broken down into small connected steps that gradually unfold the concept, providing access for all children and leading to a generalisation of the concept and the ability to apply the concept to a range of contexts. Pupils are taught through whole-class interactive teaching, where the focus is on all pupils working together on the same lesson content at the same time, as happens in Shanghai and several other regions that teach maths successfully. This ensures that all can master concepts before moving to the next part of the curriculum sequence, allowing no pupil to be left behind. If a pupil fails to grasp a concept or procedure, this is identified quickly and early intervention ensures the pupil is ready to move forward. This could happen during the lesson or inbetween lessons. It may be a quick 5 minute activity or chat, a more sustained amount of intervention over time or anything in between.

Representation and Structure

Representations used in lessons expose the mathematical structure being taught, the aim being that students can do the maths without recourse to the representation. Significant time is spent developing deep knowledge of the key ideas that are needed to underpin future learning. The structure and connections within the mathematics are emphasised, so that pupils develop deep learning that can be sustained. The school's calculation policy (appendix 1) and the [NCETM PD materials](#) can support teachers with these choices.

Mathematical Thinking

If taught ideas are to be understood deeply, they must not merely be passively received but must be worked on by the student: thought about, reasoned with and discussed with others. The focus on language and communication in our lessons (sentence stems, talk partner activities, verbalisation, emphasis on whole sentence answers) contributes to this depth of mathematical thinking. At WHPS, we have a [mathematical thinking Google Drive](#) which is an ever-evolving collection of mathematical tasks that teachers can use to teach the key mathematical thinking skills identified and exemplified below and [in this document](#).

Problem Solving and Reasoning Suggested Activities (working document)

Skill	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	
Trial & improvement	ones, twos, threes	Page numbers	Stickers	Triangles	Inverse operations	Family trek	
Working systematically (finding all possibilities)	I'm thinking of a number	Boys and girls	Cars	Combinations	Hand shakes	Darts	
Logic (using known facts, elimination and deduction, using the inverse)	MM starter book p20	MM starter book p23	1 to 8 box	Magic curves	Crack the code	Alien operations	
Spotting and identifying patterns (inverse, repetition, multiples, factors, primes)	MM starter book p27	Multiplication patterns	Corners 1	Elevenses 1	Logic problems with grids		
Comparing and contrasting	MM starter book p13	Whiterose problems	Corners p2	Elevenses 2	Patterns	Seeds	
Making conjectures	MM starter book p11	Sweets	Weight	HTO	Take away	Compare dont calculate	
Generalising			Planet Zoot	Dice games	Nim	Regions 1 Regions 2	
Working backwards (deriving information)	I chose a number	This happens all the time - regular and specific use of the word in maths lessons					Wb with length
Visualising/drawing	Matchstick puzzle 1	Tangrams	Addition table	WB with age	WB with weight		
Proving & disproving			Halving 1 Halving 2	Tree stumps	Frog jumps	Trees	

Fluency

Quick and efficient recall of facts and procedures and the flexibility to move between different contexts and representations of mathematics. Key facts such as multiplication tables and addition facts within 10 are learnt to automaticity to avoid cognitive overload in the working memory and enable pupils to focus on new concepts.

Variation

Variation is twofold. It is firstly about how the teacher represents the concept being taught, often in more than one way, to draw attention to critical aspects, and to develop deep and holistic understanding. It is also about the sequencing of the episodes, activities and exercises used within a lesson and follow up practice, paying attention to what is kept the same and what changes, to connect the mathematics and draw attention to mathematical relationships and structure. It is recognised that practice is a vital part of learning and teachers carefully design tasks that help the child's learning develop in a way specific to the learning objective.

iii. Implementation: Maths in the EYFS

The EYFS Statutory Framework 2014 sets standards for the learning, development and care of children from birth to five years old and supports an integrated approach to early learning. This is supported by the 'Development matters' non statutory guidance. The EYFS Framework in relation to mathematics aims for our pupils to:

- develop and improve their skills in counting
- understand and use numbers
- calculate simple addition and subtraction problems
- describe shapes and use them for different purposes
- develop a sense of position and direction and different measures

We follow the EYFS curriculum guidance for Mathematics and make use of the Mathematics Mastery resources to help plan learning experiences. However, we are committed to ensuring the confident development of number sense and put emphasis on mastery of key early concepts. Pupils explore the 'story' of numbers to twenty and the development of models and images for numbers as a solid foundation for further progress. Teachers use the concrete – pictorial – abstract approach to conceptual development in line with 5 big ideas of Teaching for Mastery.

Children in reception are introduced to Maths With Parents to encourage home learning experiences in summer term (at a point when the teachers feel it is appropriate for the cohort). At WHPS, we value the impact parents can have on their child's maths learning so seek to support and nurture this from an early age through games and conversation. Maths With Parents is an online platform which teaches families a new maths game to play in a hands on way at home using items from around the house or provided by school.

Please see the EYFS Maths policy document for more detailed information.

iv. Implementation: Maths in KS1

The principal focus of mathematics teaching in key stage 1 is to ensure that pupils develop confidence and mental fluency with whole numbers, counting and place value. This should involve working with numerals, words and the four operations, including with practical resources [for example, concrete objects and measuring tools]. At this stage, pupils should develop their ability to recognise, describe, draw, compare and sort different shapes and use the related vocabulary. Teaching should also involve using a range of measures to describe and compare different quantities such as length, mass, capacity/volume, time and money. By the end of year 2, pupils should know the number bonds to 20 and be precise in using and understanding place value. An emphasis on practice at this early stage will aid fluency. Pupils should read and spell mathematical vocabulary, at a level consistent with their increasing word reading and spelling knowledge at key stage 1.

We ensure coverage through designing our [yearly planning overviews](#) (based on the master document in appendix 2) which then go into more detail on a termly and weekly basis. Year 1 children are taught through Continuous Provision and Mathematics Mastery resources are carefully considered and integrated into this provision. As we follow a blocked curriculum, we plan to revisit and revise content through regular maths meetings to ensure children have opportunity to recall and remember prior learning. We utilise the testing effect, interleaving effect and spacing effect to help us do this. We plan using a combination of Mathematics Mastery materials, NCETM primary professional development materials and the government's Ready to Progress document and NCETM exemplification. Power Maths textbooks and the

White Rose Hub's online resources are also available for teacher reference and task selection though we do not use the schemes directly.

In Year 1, home learning is continued through the use of Maths With Parents with tasks being set each week or two-weeks depending on the time of year and teacher discretion. We use 'I have a new Maths With Parents activity' stickers to remind children and parents of outstanding homework as necessary throughout the week. Maths With Parents is an online platform which teaches families a new maths game to play in a hands on way at home using items from around the house or provided by school.

In Year 2, home learning transitions from games to paper homework. In the autumn term, homework will be focussed around enjoying maths games together at home using a paper instruction sheet. All materials will be readily accessible at home or provided by school. In the spring term, children will begin to receive fluency based maths homework on paper in a similar style to their spelling test. Children will be expected to recall number facts to answer the questions. The number facts will be directly linked to learning from previously in the year so will not be brand new to the children.

v. Implementation: Maths in lower KS2

The principal focus of mathematics teaching in lower key stage 2 is to ensure that pupils become increasingly fluent with whole numbers and the four operations, including number facts and the concept of place value. This should ensure that pupils develop efficient written and mental methods and perform calculations accurately with increasingly large whole numbers. At this stage, pupils should develop their ability to solve a range of problems, including with simple fractions and decimal place value. Teaching should also ensure that pupils draw with increasing accuracy and develop mathematical reasoning so they can analyse shapes and their properties, and confidently describe the relationships between them. It should ensure that they can use measuring instruments with accuracy and make connections between measure and number. By the end of year 4, pupils should have memorised their multiplication tables up to and including the 12 multiplication table and show precision and fluency in their work. Pupils should read and spell mathematical vocabulary correctly and confidently, using their growing word reading knowledge and their knowledge of spelling.

We ensure coverage through designing our [yearly planning overviews](#) (based on the master document in appendix 2) which then go into more detail on a termly and weekly basis. As we follow a blocked curriculum, we plan to revisit and revise content through regular maths meetings to ensure children have opportunity to recall and remember prior learning. We utilise the testing effect, interleaving effect and spacing effect to help us do this. We plan using a combination of Mathematics Mastery materials, NCETM primary professional development materials and the government's Ready to Progress document and NCETM exemplification. Power Maths textbooks and the White Rose Hub's online resources are also available for teacher reference and task selection though we do not use the schemes directly.

In Year 3 and 4, children have access to maths home learning on the Mathletics website. All children have log ins and are assigned tasks that suit their ability. Homework is set once a week. They may have one or multiple tasks set, depending on the length, difficulty and teacher discretion. Children are expected to complete their tasks each week and have the chance to earn a certificate which will be awarded in Tuesday's Achievement Assemblies. Children can also see their certificates and online rewards linked to their avatar on the Mathletics website.

Year 3 children continue to receive the fluency based quizzes as part of their home learning as they did in Year 2 to solidify these number facts further.

Year 4 children focus heavily on learning their times tables with fast recall. There is an expectation that they continue to practise their times tables at home every week in addition to their Mathletics homework. At different points in the year, the teachers will provide year 4 children with different methods and

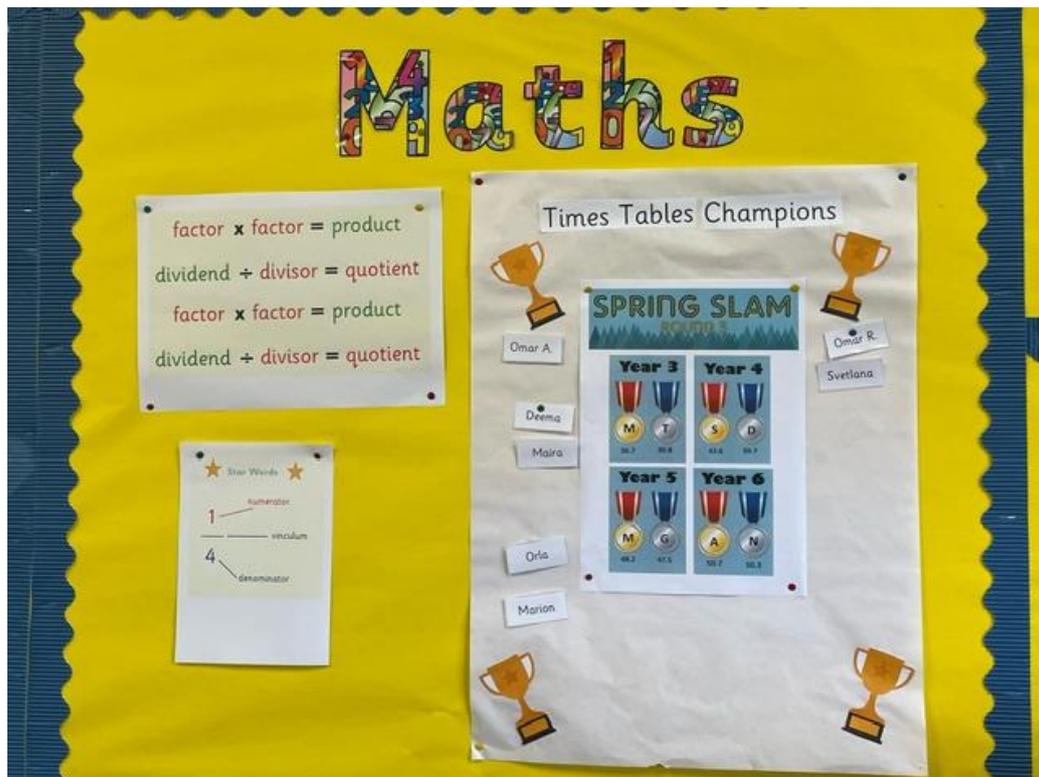
resources to do this including times tables revision cards (which children make themselves) and access to games such as Stick and Split (usually in the spring term).

Below is our rigorous approach to the teaching and revision of times tables, an essential part of learning at this phase. There is an extensive set of slides available to year 3 and 4 teachers which focus on the actual teaching of times tables, inspired by the representations seen in the NCETM PD materials. You can see the order of the teaching of times tables in the times tables policy and curriculum overviews. By the end of Y4, children should have learnt all of their times tables through well planned, sequential lessons which focus on multiplicative thinking. They will also practise their times tables using chanting, games, recall activities and testing.

Term	Year 3	Year 4
Autumn	<p>Consolidate 10, 5, 2 (recommended order) Teach 4, 8</p> <p>Daily</p> <ul style="list-style-type: none"> ● Skip counting on a number stick ● Chanting in format “four fours are sixteen, five fours are twenty, six fours are...” ● Quick fire questions (2 x 4 or 4 x 2) e.g. Daily 10 <p>And when chn ready, start to build in:</p> <ul style="list-style-type: none"> ● If this is the answer, what was the question? E.g. Teacher says 15, children say 3 x 5. ● Multiplication triangles with variety of missing numbers. ● Multiplication heads game (instructions here) 	<p>Consolidate 3, 4, 6, 8, 9 Teach 7, 11, 12</p> <p>Daily:</p> <ul style="list-style-type: none"> ● Skip counting on a number stick ● Chanting in format “four fours are sixteen, five fours are twenty, six fours are...” ● Quick fire questions (2 x 4 or 4 x 2 and $8 \div 4$ or $8 \div 2$) e.g. Daily 10 ● If this is the answer, what was the question? E.g. Teacher says 15, children say 3 x 5. ● Multiplication triangles with variety of missing numbers. ● Multiplication heads game (instructions here) <p>Twice every half term: 12x12 times tables quiz - once at the beginning of the half term and once at the end. Save results in Maths folder > fluency > times tables > 12x12 grid > Y4</p> <p>Introduce the MTC and structure using Mathsframe.</p> <p>See the next page for an example of an incentive that could be used alongside/before/after the Spring Slam</p>
Spring	<p>Consolidate 4, 8 Teach 3, 6</p> <p>Daily:</p> <ul style="list-style-type: none"> ● Skip counting on a number stick ● Chanting in format “four fours are sixteen, five fours are twenty, six fours are...” ● Quick fire questions (2 x 4 or 4 x 2) e.g. Daily 10 ● If this is the answer, what was the question? E.g. Teacher says 15, children say 3 x 5. ● Multiplication triangles with variety of missing numbers. ● Multiplication heads game (instructions here) <p>Twice every half term: 12x12 times tables quiz - once at the beginning of the half term and once at the end. Save results in Maths folder > fluency > times tables > 12x12 grid > Y3</p> <p>The Spring Slam will also take place during this term.</p>	<p>Consolidate all.</p> <p>Daily:</p> <ul style="list-style-type: none"> ● Skip counting on a number stick ● Chanting in format “four fours are sixteen, five fours are twenty, six fours are...” ● Quick fire questions (2 x 4 or 4 x 2 and $8 \div 4$ or $8 \div 2$) e.g. Daily 10 ● If this is the answer, what was the question? E.g. Teacher says 15, children say 3 x 5. ● Multiplication triangles with variety of missing numbers. ● Multiplication heads game (instructions here) <p>Twice every half term: 12x12 times tables quiz - once at the beginning of the half term and once at the end. Save results in Maths folder > fluency > times tables > 12x12 grid > Y4</p> <p>Fortnightly increasing to weekly as term goes on Maths frame MTC test. Chn to write results on stickers and put into maths books.</p> <p>At this point in the year, we introduce the use of the ‘Stick and Split’ game which all children have log ins for to encourage depth of understanding and renew excitement for practicing times tables facts in a different way. These log ins continue till the end of Y5.</p> <p>If required, a times table club could also be run at this point in the year.</p> <p>The Spring Slam will also take place during this term.</p>
Summer	<p>Consolidate 3, 4, 6, 8 Teach 9</p> <p>Daily:</p> <ul style="list-style-type: none"> ● Skip counting on a number stick ● Chanting in format “four fours are sixteen, five fours are twenty, six fours are...” ● Quick fire questions (2 x 4 or 4 x 2 and $8 \div 4$ or $8 \div 2$) e.g. Daily 10 ● If this is the answer, what was the question? E.g. Teacher says 15, children say 3 x 5. 	<p>Consolidate all.</p> <p>Daily:</p> <ul style="list-style-type: none"> ● Skip counting on a number stick ● Chanting in format “four fours are sixteen, five fours are twenty, six fours are...” ● Quick fire questions (2 x 4 or 4 x 2 and $8 \div 4$ or $8 \div 2$) e.g. Daily 10 ● If this is the answer, what was the question? E.g. Teacher says 15, children say 3 x 5.

<ul style="list-style-type: none"> • Multiplication triangles with variety of missing numbers • Multiplication heads game (instructions here) <p>Twice every half term: 12x12 times tables quiz - once at the beginning of the half term and once at the end. Save results in Maths folder > fluency > times tables > 12x12 grid > Y3</p>	<ul style="list-style-type: none"> • Multiplication triangles with variety of missing numbers. • Multiplication heads game (instructions here) <p>Weekly increasing to twice weekly Maths frame MTC test. Chn to write results on stickers and put into maths books.</p> <p>June – MTC test July – MTC test results</p>
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When a child completes their Mathsframe MTC quiz and either improves on their previous score or gets full marks, they get their name put on the champions board. This could be adapted for the Spring Slam and reset at different times of the year if you need.



vi. Implementation: Maths in upper KS2

The principal focus of mathematics teaching in upper key stage 2 is to ensure that pupils extend their understanding of the number system and place value to include larger integers. This should develop the connections that pupils make between multiplication and division with fractions, decimals, percentages and ratio. At this stage, pupils should develop their ability to solve a wider range of problems, including increasingly complex properties of numbers and arithmetic, and problems demanding efficient written and mental methods of calculation. With this foundation in arithmetic, pupils are introduced to the language of algebra as a means for solving a variety of problems. Teaching in geometry and measures should consolidate and extend knowledge developed in number. Teaching should also ensure that pupils classify shapes with increasingly complex geometric properties and that they learn the vocabulary they need to describe them. By the end of year 6, pupils should be fluent in written methods for all four operations, including long multiplication and division, and in working with fractions, decimals and percentages. Pupils should read, spell and pronounce mathematical vocabulary correctly

We ensure coverage through designing our [yearly planning overviews](#) (based on the master document in appendix 2) which then go into more detail on a termly and weekly basis. As we follow a blocked curriculum, we plan to revisit and revise content through regular maths meetings to ensure children have opportunity to recall and remember prior learning. We utilise the testing effect, interleaving effect and spacing effect to help us do this. We plan using a combination of Mathematics Mastery materials, NCETM primary professional development materials and the government's Ready to Progress document and NCETM exemplification. Power Maths textbooks and the White Rose Hub's online resources are also available for teacher reference and task selection though we do not use the schemes directly.

In upper Key Stage 2, emphasis is put on children having the fluency and capacity to draw on different aspects of their maths knowledge at any given time. In years 5 and 6, children are often expected to work independently on a set of maths problems that are not from the same topic e.g. fluent in five or a similar approach. This continues to develop their retrieval of learning and therefore encourages memory.

In Year 5 and 6, children are set maths homework weekly. Year 5 and 6 teachers send home a paper copy of homework. Year 6 teachers may send home a pack containing all homework for the half term. This pack also includes the answers so children can self mark and receive immediate feedback on their learning, helping them to identify and address errors in a timely and effective manner.